THE UNIVERSITY OF KANSAS
SCIENCE BULLETIN

VOL. XXII.] APRIL 15, 1935 [No. 16.

The Genus Abedus Stal. (Hemiptera, Belostomatidae)

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ABSTRACT: The genus ABEDUS is found only in the New World, where it is confined to the territory extending from California and Arizona through Mexico to Panama. *Abedus herberti* from Arizona is described as new. (Types in the Francis Huntington Snow Collection of the University of Kansas.)

The following species are keyed out and redescribed: *A. signoreti* Mayr, *A. ovatus* Stal, *A. breviceps* Stal, *A. dilatatus* (Say), *A. macronyx* (Mayr), *A. montandoni* De Carlo, *A. hungerfordi* De Carlo and *A. indentatus* (Hald).

THE Belostomatidae is a family of aquatic Hemiptera, most species of which are above average size. While these insects rear their young and spend most of their adult lives in the water, they frequently fly by night and are attracted to lights. Thus they come to the attention of many people. The larger forms especially are known as giant water bugs or electric light bugs. The family is widely distributed over the world and is divided into a number of genera. One of these genera is Abedus Stal, which is confined to a restricted portion of the new world.

Abedus Stal was erected by Stal in 1862 to embrace two new species of Belostomatidae which he named *Abedus ovatus* Stal, and *Abedus breviceps* Stal. He characterized the genus as follows: metasternum strongly keeled; antennae four segmented with a long curved prolongation from the second and third segments; abdominal venter lacking strong hairs, at least in the middle.

In 1862, in the same paper, Stal established the new genus Serphus, differentiating it from Abedus Stal in that it has an entirely pubescent abdominal venter and three-segmented antennae, and placed the species *Belostoma dilatatus* Say in this genus.

In 1863 Mayr established the genus Stenoscytus Mayr, using as characteristics: the first joint of the beak longer than the second;

only the third joint of the antennae with a prolongation; and metasternum with a long and stout metaxyphus. *Stenoscytus mexicanus* Mayr was described under the genus. In the same paper Mayr, 1863, created the genus Pedinocoris, separating it from Stenoscytus Mayr by the following characters: first joint of the beak shorter than the second; a prolongation from the second and third segments of the antennae; and metaxyphus not keeled. He described the species *Pedinocoris macronyx* Mayr and *P. brachonyx* Mayr. In 1871, Mayr placed the genus Stenoscytus Mayr in synonymy with *Abedus* Stal.

In 1897 Kirkaldy established the genus *Deinostoma* Kirk. He placed Say's *Belostoma dilatatus*, which had been described in 1831 by Say, and designated by Stal in 1862 under *Serphus dilatatus* (Say), under the new genus Deinostoma Kirkaldy, and characterized the genus Deinostoma Kirk. as having a metasternal keel, a three-segmented antenna, and an entirely pubescent abdominal venter.

J. A. De Carlo,[4] in his work, considers Serphus Stal, 1862, Stenoscytus Mayr, 1863, Pedinocoris Mayr, 1863, and Deinostoma Kirk., 1897, as synonyms of Abedus Stal.

The key metasternum for the genera of the family Belostomatidae found in North America is as follows:

A. Metasternum with a strong mid-ventral keel (or at least elevated); membrane of the hemelytra reduced..... *Abedus* Stal

AA. Metasternum without a mid-ventral keel; membrane of the hemelytra not reduced.

B. Basal segment of the beak longer than the second; base of the wing-membrane nearly or quite straight. Body about 25 mm. or less in length..... *Belostoma* Latr.

BB. Basal segment of the beak shorter than the second; base of the wing-membrane sinuous. Body more than 37 mm. in length.

C. Anterior femora grooved for the reception of the tibiae. *Lethocerus* Mayr

CC. Anterior femora not grooved for the reception of the tibiae. *Benacus* Stal

The distribution of the genus *Abedus* Stal extends from California to Panama as shown by the map on page 519, plate LII.

The following nine species are recognized in this paper: *A. signoreti* Mayr; *A. ovatus* Stal; *A. breviceps* Stal; *A. dilatatus* (Say); *A. macronyx* (Mayr); *A. indentatus* (Hald.); *A. montandoni* De Carlo; *A. hungerfordi* De Carlo; and *A. herberti* n. sp.

Mayr described *Stenoscytus mexicanus* Mayr as a new species in 1863. Champion, 1901, figures this species as a synonym of *Abedus ovatus* Stal.

Abedus vicinus was described by Mayr in 1871. A female speci-

men was the type specimen. Champion, 1901, says that with the types of *A. signoreti* Mayr and *A. vicinus* Mayr before him, he cannot see any specific differences. Mayr used a male specimen in describing *A. signoreti* Mayr, which probably is responsible for the slight differences which caused him to describe the female and male as separate species.

Haldeman[6] described *Abedus indentatus* (Hald.), 1853, under the genus Zaitha. Uhler, 1877, placed this species under the genus Pedinocoris Mayr, and made *Pedinocoris brachonyx* Mayr synonymous with *indentatus*. In 1900 Montandon placed Serphus Stal, Pedinocoris Mayr and Deinostoma Kirkaldy, synonyms of Abedus Stal.

The species are separated into two main groups, one with abdominal venter entirely pubescent and the other in which the abdominal venter is not entirely pubescent. In the first group there are six species, three of which—*A. dilatatus* (Say), *A. macronyx* (Mayr), and *A. montandoni* De Carlo—have three-segmented antennae, with or without a definite prolongation from the second segment and none from the third segment. *A. dilatatus* (Say) can be separated from the other two species by having the metaxyphus keeled. *A. macronyx* (Mayr) is separated from *A. montandoni* De Carlo in that *A. macronyx* has a three-segmented antenna with no prolongations and *A. montandoni* De Carlo has a three-segmented antenna with a short prolongation from the second segment. The other three species in the first group are: *A. hungerfordi* De Carlo; *A. indentatus* (Hald.); and *A. herberti* n. sp. *A. hungerfordi* De Carlo has four-segmented antenna with a prolongation from the second and third segments and the other species have three-segmented antennae with a prolongation from the second and third segments. *A. indentatus* (Hald.) has very short and stout front tarsal claws (three fourths as long, or less than the terminal tarsal segment); while *A. herberti* n. sp. has front tarsal claws as long or longer than the terminal tarsal segment. *A. herberti* n. sp. also differs from *A. indentatus* (Hald.) in that the caudal filaments of *A. herberti* n. sp. have a swollen pouch-like structure on the dorsal side.

In the second group the three species *A. signoreti* Mayr, *A. ovatus* Stal, and *A. breviceps* Stal, may be separated by the abdominal venter characters, the antennae and the caudal filaments. *A. signoreti* Mayr has the abdominal venter entirely glabrous (in some specimens there is a little pubescence along the lateral borders

of the pleura), the antennae are three- or four-segmented with a long prolongation from the second and third segments, the membrane of the hemelytra with conspicuous closed cells, and caudal filaments long and slender. *A. ovatus* Stal has the abdominal venter with an elongated, inverted, V-shaped glabrous area along the median ridge, the antennae three- or four-segmented with a very short prolongation from the second and third segments, and the membrane of the hemelytra with no conspicuous closed cells, and *A. breviceps* Stal has the abdominal venter covered with an irregular, fairly broad, glabrous area along the median ridge, antennae three- or four-segmented with a long prolongation from the second and third segments, and the membrane of the hemelytra with conspicuous closed cells.

A general survey of the characters of the genus Abedus Stal was made. The antennae were studied first, but their characters were found not to be specific, although they have proven to be good group characters. The antennae are either three- or four-segmented, with or without prolongations from the second and third segments. When only one of the segments is prolonged, it is the second, but the third segment is never prolonged alone. The greatest variation in antennal characters is found within the species *A. signoreti* Mayr. The antennae are three- or four-segmented, with the second and third segments bearing a prolongation. The prolongations of the second and third segments vary in the degree of curvature from a pronounced curve to a straight segment.

The metaxyphus was found to be a good group character, but not specific. The form and degree of elevation of keel varies to a great extent within the species. The abdominal venter shows good specific characteristics. Its degree of pubescence separates the species into two groups. One group has an entirely pubescent abdominal venter. This group includes *A. dilatatus* (Say), *A. macronyx* (Mayr), *A. montandoni* De Carlo, *A. hungerfordi* De Carlo, *A. indentatus* (Hald.), and *A. herberti* n. sp. In the other group are included *A. signoreti* Mayr, *A. ovatus* Stal, and *A. breviceps* Stal. The species of the latter group can be separated by the degree of pubescence on the abdominal venter.

The length of the fore-tarsal claws is the character used in separating *A. indentatus* (Hald.) from the following similar species: *A. hungerfordi* De Carlo, *A. dilatatus* (Say), *A. macronyx* (Mayr), and *A. herberti* n. sp. *A. indentatus* (Hald.) has the front tarsal claws not more than three fourths as long as the terminal segment,

while in the other species the front tarsal claws are as long or longer than the terminal tarsal segment. The tarsal claws of the middle and hind legs show no specific characters.

The wings show differential characteristics only in the membrane. The membrane of the hemelytra of *A. ovatus* Stal is very narrow and lacks closed cells. In the other species the width of the membrane varies with the size of the species.

The size of each species varies within certain measurements, but since several species may be about the same size, it is a character which is not worth considering.

The genitalia do not even show group characters. The caudal filaments are specific in character. The long and slender caudal filaments of *A. signoreti* Mayr separate it from the other species. The caudal filaments of the other species are somewhat similar, but separate the species into two groups. The first group has caudal filaments with a swollen pouch-like structure on the dorsal side about the middle of each filament. It includes *A. ovatus* Stal, *A. herberti* n. sp., and *A. dilatatus* (Say). The second group, *A. breviceps* Stal, *A. hungerfordi* De Carlo, *A. indentatus* (Hald.), and *A. montandoni* De Carlo, have no such structure.

The interocular space as compared with the width of the hind tibiae was also considered, but it was found that the proportions of the measurements vary with the size of the species.

KEY TO THE SPECIES OF THE GENUS *Abedus* STAL.

1. Abdominal venter entirely pubescent 4
1A. Abdominal venter not entirely pubescent 2
2. Abdominal venter entirely glabrous; (in some specimens some degree of pubescence is present along the pleural border), antennae three- or four-segmented with a long prolongation from the second and third segments. . . *signoreti* Mayr, p. 498
2A. Abdominal venter not entirely glabrous 3
3. Abdominal venter with an elongated, inverted, V-shaped glabrous area along the median ridge; antennae three- or four-segmented with a very short prolongation from the second and third segments; caudal filaments short, broad, and with a swollen pouch-like structure on the dorsal side, about mid-length of each filament ..... *ovatus* Stal, p. 499
3A. Abdominal venter with an irregular, fairly broad, glabrous area along the median ridge; antennae three- or four-segmented with a long prolongation from the second and third segments; caudal filaments short and broad. . . *breviceps* Stal, p. 501
4. Antennae three- or four-segmented with a definite prolongation from the second and third segments 7
4A. Antennae three-segmented with or without a definite prolongation from the second segment, none from the third 5
5. Metaxyphus keeled; caudal filaments long, broad, with a swollen-like structure on the dorsal side of each filament, and a band of dark hairs across each filament beyond the middle ..... *dilatatus* (Say), p. 502
5A. Metaxyphus not keeled 6
6. Antennae three-segmented with no prolongation from any segment.
macronyx (Mayr), p. 503

6A. Antennae three-segmented, with a short prolongation from the second segment. *montandoni* De Carlo, p. 504
7. Antennae four-segmented; a prolongation from the second and third segments; caudal filaments long, broad, and stout ..... *hungerfordi* De Carlo, p. 505
7A. Antennae three-segmented; a prolongation from the second and third segments... 8
8. Front tarsal claws very short and stout (three fourths as long or less, than the terminal tarsal segment); caudal filaments long, stout and without a swollen pouch-like structure on the dorsal side of each filament.... *indentatus* (Hald.), p. 506
8A. Front tarsal claws as long or longer than the terminal tarsal segment; caudal filaments long, broad, and with a swollen-like structure on the dorsal side of each filament..... *herberti* n. sp., p. 507

Abedus signoreti Mayr, 1871

(Plate XLIX, fig. 2)

1871. *A. signoreti* Mayr. Verh. Zool.-Bot. Ges. Wien, XXI, p. 404.
1871. *A. vicinus* Mayr. Verh. Zool.-Bot. Ges. Wien, XXI, p. 405.
1901. *A. signoreti* Mayr. Champion, Biol. Centr. Am., Heter., II, p. 363, pl. 21. (Says *A. vicinus* Mayr is synonym.)

Size. (Ten specimens measured). Average length from the front of the eyes to the tip of the abdomen, 24.3 mm., average width, between inner posterior border of the eyes 2.7 mm., width of head including the eyes 6 mm., width of anterior portion of prothorax 7 mm., width of posterior border of metathorax 9.3 mm., greatest width about midlength of hemelytra 13.7 mm.

Color. Dorsal side: color varies from light brown to dark brown; with head, prothorax, scutellum, and membrane darkest of all. Ventral side: tibiae of forelegs with two wide, yellow crossbands on the outer surface; abdominal venter glabrous, yellowish-brown, the operculum finely punctate; pleural region covered with light to dark brown hairs; caudal filaments yellow, long and slender.

Structural Characteristics. Antennae slender, three- or four-segmented with the second and third segments each extending into a long and curved prolongation which is about intermediate in length between those of *A. ovatus* Stal and *A. breviceps* Stal; the membrane of the hemelytra with several closed cells, and 2.5 mm. in width at its widest point; metaxyphus strongly keeled; caudal filaments long and slender and covered with long hairs.

Types. Mayr, 1871, in his description fails to designate types. He merely states that there are two specimens from Mexico and one from Guatemala in the Museum at Stockholm in Signoret's collection. However, Champion (1901) says, "with types of *A. signoreti* Mayr ♀ and *A. vicinus* (Mayr) ♂ before me. . . ."

H. B. Hungerford, 1928, while examining entomological collections in Europe, compared the specimens of these species in the Museum at Stockholm and Vienna with specimens from the Francis

Huntington Snow Entomological Collection of the University of Kansas. He tells me that he agrees with Champion, 1901, that *A. vicinus* Mayr and *A. signoreti* Mayr are the same species.

Comparative Notes. This is one of the smallest species in the genus, and can be separated from the other two small species, *A. ovatus* Stal and *A. breviceps* Stal, by the glabrous venter, wide membrane, antennae, and caudal filament characters as shown by Plate XLIX, fig. 2; Plate L, fig. 7; Plate LI, fig. 4.

Data on Distribution. Mayr, 1871, mentions the fact that there is one specimen in Signoret's collection labeled from Guatemala.

I have seen the following in the Francis Huntington Snow Entomological Collection: Mexico: Rio de las Balsas, Guerrero, Hobart Smith 1932; Colima, Dr. O. Staudinger 1929. Central America: El Salvador, R. A. Stirton; San Jose, Costa Rica, H. Schmidt 1932; Rio Virilla, Costa Rica, H. Schmidt 1931. Panama: Chiriqua, Staudinger 1912; Patria? From the United States National Museum, Washington, D. C.: One specimen labeled "Victoria, Tamaulipas XII-10-09, Mex., F. C. Bishop collector." Another specimen is labeled "Rio Acelhuate, San Salvador, Salvador, 1-21-24, Hildebrand collector."

Abedus ovatus Stal, 1862

Plate XLIX, fig. 1

1862. *A. ovatus* Stal. Stet. Ent. Zeit., XXIII, p. 461.

1863. *Stenoscytus* Mayr. Verh. Zool.-Bot. Ges. Wien, XIII, pp. 343-347, Pl. II, figs. 6-10.

1863. *S. mexicanus* Mayr. Verh. Zool.-Bot. Ges. Wien, XIII, p. 347, Pl. II, figs. 6-10.

1901. *A. ovatus Stal.* Champion, Biol. Centr. Amer., Heter., II, p. 363, Pl. 21, fig. 19. (Says *S. mexicans* Mayr is synonym.)

Size. (Ten specimens measured.) Average length from the front of the eyes to the tip of the abdomen 24.9 mm., average width of head between inner posterior border of the eyes 3 mm., width of head including the eyes 6.4 mm., width of anterior portion of prothorax 6.9 mm., width of posterior border of metathorax 9.5 mm., greatest width about midlength of hemelytra 14.6 mm.

Color. Dorsal side: dusky brown, varying from dark to somewhat lighter shades in different specimens; with head, prothorax, and scutellum darker brown. Ventral side: tibiae of forelegs with two yellow crossbands on the outer surface; similar bands may be seen on the tibiae of the middle and hind legs of some specimens; abdominal venter entirely pubescent except for an elongated inverted V-shaped glabrous area along the median ridge; the hairs

covering the abdominal venter are of a light brown to a dark grayish color; caudal filaments with black hairs.

Structural Characteristics. Antennae slender, three- or four-segmented, having on the second and third segments a short, straight prolongation which is shorter than the antennal prolongations of *A. breviceps* Stal and *A. signoreti* Mayr; the membrane of the hemelytra without any closed cells and .5 mm. at its widest point; metaxyphus strongly keeled; caudal filaments broad and stout, with a swollen pouch-like membrane on the dorsal side of each filament as shown on Plate LI, fig. 7.

Types: Stal, 1862, in his description of this species does not designate types. He states that the specimens are in the Museum at Stockholm, and in the collection of Signoret. He says nothing of the habitat of this species, except that the work in which the description was published is called "Hemiptera Mexicana." Mayr, 1863, says that specimens of *Stenoscytus mexicanus* (Mayr) may be found in the "Kaiserliche Zoölogische Museum at Wien," and in his collection from Mexico; and for *Abedus ovatus* Stal he says that specimens from Mexico are found in the Museum in Stockholm and Museum in Vienna, in the collection of Signoret, Fieber, and Mayr. H. B. Hungerford, 1928, while examining entomological collections in Europe, says the following about a specimen which is in the Museum at Stockholm: "the specimen has an old paper label 'ovatus Stal' 'Mexico' 'Signt.' It must be the type."

Comparative Notes. This is one of the smallest species that has been described in the genus, and can be separated from the other small species—*A. signoreti* Mayr, *A. breviceps* Stal—by the presence of an elongated inverted V-shaped bare area along the median ridge on the abdominal venter (Pl. XLIX, fig. 1); with a short, straight prolongation from the second and third segments (Pl. L, fig. 4); and caudal filament characters as shown on Plate LI, fig. 7.

Data on Distribution. Champion, 1901, gives the following data: "North America—Arizona, Texas, Lower California. Mexico: Xauripa in Guerrero, and Jalapa.

I have seen the following in the Francis Huntington Snow Entomological Collection: Mexico: Real de Arriva District of Temascaltepec, H. E. Hinton 1933. San Cristobal, 1920 and 1929.

Abedus breviceps Stal, 1862

(Plate XLIX, fig. 3)

1862. *A. breviceps* Stal. Stet. Ent. Zeit., XXIII, p. 462.
1871. *A. breviceps* Stal. Mayr, Verh. Zool.-Bot. Ges. Wien, XXI, p. 404.
1901. *A. breviceps* Stal. Champion, Biol. Centr. Am., Heter., II, p. 363, Pl. 21, fig. 20.

Size. (Ten specimens measured.) Average length from the front of the eyes to the tip of the abdomen 26.08 mm.; average width, between inner posterior border of the eyes 3 mm., width of head including the eyes 6.5 mm.; width of anterior portion of prothorax 6.8 mm.; width of posterior border of metathorax 10.4 mm.; greatest width about mid-length of hemelytra 15.6 mm.

Color. Dorsal side: color varies from a light brown to a dark brown; with head, prothorax, and scutellum reddish-brown. Ventral side: tibiae of forelegs with two yellow crossbands on the outer surface; abdominal venter bare along the median ridge but covered with reddish-yellow hairs along the pleural border, the hairs on the pleural area lighter in color; caudal filaments with dark brown and yellow hairs.

Structural Characteristics. Antennae slender, three- or four-segmented, having on the second and third segments a long, curved prolongation which is longer than the prolongations on the antennae of *A. signoreti* Mayr; the membrane of the hemelytra with a few closed cells and 1.7 mm. at its widest point; metaxyphus strongly keeled; caudal filaments broad and stout, and without a swollen pouch-like structure on the dorsal side of each.

Types. Stal, 1862, in his description of this species does not designate types. He states that the specimens are in the Museum at Stockholm, and in the collection of Signoret. He gives no locality of the specimens he described, except that the work in which the description was published is called "Hemiptera Mexicana." Mayr, 1863, gives as location of some specimens the Museum at Stockholm in Signoret's collection and in the Museum at Vienna. H. B. Hungerford, 1928, while examining entomological collections in Europe, compared some specimens of *A. breviceps* Stal from the Francis Huntington Snow Entomological Collection at the University of Kansas with specimens of that species found in the Museum at Stockholm and in the Museum at Vienna.

Comparative Notes. This is one of the smallest species in the genus, and can be separated from the two other small species, *A. signoreti* Mayr and *A. ovatus* Stal, by the presence of hair along the border of the abdominal venter (Pl. XLIX, fig. 3); antennae

as shown in Plate L, figure 8; and caudal filament characters as shown by Plate LI, figure 2.

Data on Distribution. Champion, 1901, gives the following location for this species. Mexico: Cuernavaca.

I have seen the following in the Francis Huntington Snow Entomological Collection at the University of Kansas: Mexico: Tejupilco, H. E. Hinton 1933; Tarandacuao, Hobart Smith 1932; San Antonio, P. A. Readio 1927, L. D. Anderson 1927, and Stevenson 1927; Real de Arriva District of Tema-scaltepec, H. E. Hinton 1933. United States: Arizona, Cochise Co., L. D. Anderson 1927; Texas, Valentino, L. D. Anderson 1927, and R. H. Beamer 1927. From the United States National Museum, Washington, D. C. One specimen labeled "Mex. 2499, Collection of C. F. Baker." Another specimen "P. R. Uhler, Collection."

Abedus dilatatus (Say), 1832

(Plate LI, fig. 8)

1832. *Belostoma dilatatus* (Say). Heter., N. Harm., p. 38; Fitch Reprint, p. 810; Compl. Writ., I, p. 366.
1862. *Serphus* Stal. Stet. Ent. Zeit., XXIII, p. 462.
1862. *Serphus dilatatus* (Say). Stal, Stet. Ent. Zeit., XXIII, p. 462.
1871. *Serphus dilatatus* (Say). Mayr, Verh. Zool.-Bot. Ges. Wien, XXI, p. 403.
1897. *Deinostoma dilatatus* (Say). Kirkaldy, Entomologist, XXX, pp. 258-259.
1901. *Deinostoma dilatatus* (Say). Champion, Biol. Centr. Am., Heter., II, p. 362, Pl. XXI, fig. 18-18a.

Size. Length of body from the front of the eyes to the tip of the abdomen (male) 29 mm., (female) 25 mm.; width between inner posterior border of the eyes (male) 3 mm., (female) 2.9 mm.; width of head including the eyes (male) 7 mm., (female) 7 mm.; width of anterior portion of prothorax (male) 8 mm., (female) 7.5 mm.; width of posterior border of metathorax (male) 10.5 mm., (female) 9.5 mm.; greatest width about mid-length of hemelytra (male) 16 mm., (female) 14.2 mm.

Color. Dorsal side: the color of this species varies, some specimens being light brown and others being dark grayish-brown, with head, prothorax, and scutellum darkest of all. Ventral side: tibiae of the forelegs with two narrow, light yellow crossbands on the outer surface; venter covered with light yellow, reddish-brown, or dark brown, velvety hairs; pleural area covered with lighter colored hairs; caudal filaments covered with brown hairs and a band of dark hairs crossing each filament beyond the middle.

Structural Characteristics. Antennae three-segmented with a short prolongation from the second segment and none from the third

segment; membrane of hemelytra with conspicuous closed cells and 1.3 mm. at its widest point; metaxyphus keeled; caudal filaments broad, stout and covered with long hairs. Each filament has a swollen pouch-like structure on the dorsal side about mid-length.

Types. Say, 1832, in his description of *Belostoma dilatatus* does not mention anything about types or their location, if there are any. Stal, 1862, mentions the Museum at Stockholm as the location of some specimens of *Serphus dilatatus* (Say). Mayr, 1863, says that there are six males and five females of this species located in the Museum at Stockholm, and also other specimens in the Museum at Vienna.

Comparative Notes. This species is about the same size as *A. signoreti* Mayr, *A. breviceps* Stal, and *A. ovatus* Stal, but it can be separated from them by the entirely pubescent venter; three-segmented antennae with or without a definite prolongation from the second segment and none from the third segment (Pl. L. fig. 6); and the caudal filaments with a swollen pouch-like structure on the dorsal side of each filament about the middle. It differs from *A. montandoni* De Carlo in that *A. dilatatus* (Say) has the metaxyphus keeled.

Data on Distribution. Champion gives the following on distribution: "North America—California, Lower California, and Arizona. Mexico—Tacubaya, San Bartolo, Puebla, and between Vera Cruz and Jalapa."

I have seen the following in the Francis Huntington Snow Entomological Collection at the University of Kansas. Mexico: Michoacan, Zitacuaro; Tarandacuao, Hobart Smith 1932. United States: Utah, St. George, L. A. Woodbury, collector.

Abedus macronyx (Mayr), 1863

(Plate L, fig. 2)

1863. *Pedinocoris macronyx* Mayr. Verh. Zool.-Bot. Ges. Wien, XIII, p. 350, Pl. II, figs. 1-4.
1863. *Pedinocoris* Mayr. Verh. Zool.-Bot. Ges. Wien, XIII, pp. 347-350, Pl. II, figs. 1-5.
1871. *Pedinocoris macronyx* Mayr. Verh. Zool.-Bot. Ges. Wien, XXI, p. 405.
1901. *Pedinocoris macronyx* Mayr. Champion, Biol. Centrali-Americana, Heter., II, p. 364.

Size. Male (one specimen in the Francis Huntington Snow Entomological Collection, University of Kansas), length from the front of the eyes to the tip of the abdomen 37.1 mm., width of head between inner posterior border of the eyes 4.9 mm., width of head including the eyes 8.9 mm., width of anterior portion of prothorax 10 mm., width of the posterior border of metathorax 13 mm., great-

est width about mid-length of hemelytra 22 mm., length of fore-tarsal claws 1.1 mm., length of terminal tarsal segment 1 mm., length of the second tarsal segment .8 mm.

Color. Dorsal side: yellowish-brown, with head, prothorax, and scutellum dark brown. Ventral side: tibiae of forelegs with two yellow crossbands on the outer surface; abdominal venter covered with dark brown, velvety hairs, which are reddish-brown on the pleural region.

Structural Characteristics. Antennae long, stout, three-segmented with no prolongation from any segment; membrane of hemelytra with closed veins and 2 mm. at its widest point; metaxyphus elevated, but not keeled; fore tarsal claw 1.1 mm. in length.

Types. Mayr, 1863, gives the "Kaiserliche Zoologische Museum" as the location of a specimen, but does not mention the type. Mayr, 1871, states that he has specimens of this species in his collection.

Comparative Notes. This is the largest species of the genus and can be separated from the other large species, *A. indentatus* (Hald.) and *A. hungerfordi* De Carlo, by the antennal and fore-tarsal characters given in the key to the species on pp. 497 and 498.

Data on Distribution. Mayr, 1863 and 1871, gives California as the habitat of this species.

Champion, 1901, adds the following localities: Mexico: Rio Mescales, Cuesta de Miscantla, and Jalapa. Lower California.

I have seen the following in the Francis Huntington Snow Entomological Collection at the University of Kansas: Arizona, F. H. Snow 1902. From the United States National Museum, Washington, D. C.: "Reddington, Arizona, Dr. W. Barnes, dedit."

Abedus montandoni De Carlo, 1932

(Plate L, fig. 5)

1932. *Abedus montandoni* De Carlo. Revista De La Sociedad Entomologica Argentina, No. 22, Nov. 30, pp. 121-123, Pl. V, figs. 5-6.

Size. Length of body from the front of the eyes to the tip of the abdomen 26 mm.; width between inner posterior border of the eyes 3.3 mm.; width of head including the eyes 7 mm.; width of anterior portion of prothorax 7 mm.; width of posterior border of metathorax 9.5 mm.; greatest width about mid-length of hemelytra 15 mm.

Color. Dorsal side: light to dark brown; with head, prothorax, and scutellum darkest of all in some specimens. Ventral side: tibiae of forelegs with two light-yellow crossbands on the outer surface; abdominal venter covered with dark brown, velvety shiny

hairs; pleural area covered with reddish brown, shiny hairs; and the connexiva light yellow.

Structural Characteristics. Antennae three-segmented, the second segment with a short prolongation; the membrane of the hemelytra with conspicuous closed cells, and 1.5 mm. at its widest point; metaxyphus elevated but not strongly keeled; caudal filaments without a swollen pouch-like structure on the dorsal side of each.

Types. Holotype, male; allotype, female; eight paratypes; Zinacantepec, Mexico, A. Spegazzini, collector. Holotype, allotype, and seven paratypes are in the Natural History Museum of Buenos Aires, catalogued under number 30432. One paratype is located in the Francis Huntington Snow Entomological Collection, University of Kansas, Lawrence, Kansas.

Comparative Notes. This species resembles *A. signoreti* Mayr, *A. breviceps* Stal, and *A. ovatus* Stal, in size and also in color, but can be distinguished from them by its entirely pubescent abdominal venter, and its metaxyphus which is not strongly keeled. It is smaller than *A. macronyx* (Mayr).

Data on Distribution. De Carlo, 1932, in his description of this species, gives as its habitat, Mexico: Zinacantepec, A. Spegazzini, collector.

I have seen the following in the Francis Huntington Snow Entomological Collection, Arizona, F. H. Snow. Mexico: Zinacantepec, A. Spegazzini collector.

Abedus hungerfordi De Carlo, 1932

(Plate L, fig. 9)

1932. *Abedus hungerfordi* De Carlo. Revista De La Sociedad Entomologica Argentina, No. 22, Nov. 30, pp. 123-124, Pl. V, figs. 3-4.

Size. (Ten specimens measured). Average length from the front of the eyes to the tip of the abdomen 34.5 mm.; width between inner posterior border of the eyes 3.4 mm.; width of head including the eyes 8 mm.; width of anterior portion of prothorax 9 mm.; width of the posterior border of metathorax 12 mm.; greatest width about mid-length of hemelytra 18.9 mm.

Color. Dorsal side: the color of this species varies from a light brown to a dark, grayish-brown, with head, prothorax, and scutellum darkest of all. Ventral side: tibiae of forelegs with two narrow, light-yellow crossbands on the outer surface; abdominal venter covered with velvety dark brown or reddish hairs; caudal filaments light yellow with a narrow band of dark hairs crossing each filament beyond the middle.

Structural Characteristics. Antennae stout, four-segmented, the second and third segments with a prolongation as in *A. ovatus* Stal, *A. signoreti* Mayr, and *A. breviceps* Stal; the membrane of the hemelytra with many closed cells and 2.5 mm. at its widest point; metaxyphus broadly elevated but not keeled; caudal filaments broad, stout, and covered with long hairs, and without a swollen pouch-like structure on the dorsal side of each.

Types: Holotype, male; allotype, female; six paratypes; one allotopotype, female; Alpine, California, L. D. Anderson, collector, July 9, 1929. Four paratypes, females, one allotopotype, female, and a holotype are located in the Francis Huntington Snow Entomological Collection, University of Kansas, Lawrence, Kansas. Three paratypes are located in the Museum of Natural History of Buenos Aires, catalogued under number 30433.

Comparative Notes. This is one of the largest species of the genus, and can be separated from the other large species, *A. dilatatus* (Say), *A. indentatus* (Hald.), and *A. herberti* n. sp., by the antennae (Pl. L, fig. 9); caudal filaments (Pl. LI, fig. 6); and fore-tarsal claw characters as given in the key to the species on pp. 497 and 498.

Data on Distribution. I have seen the following in the Francis Huntington Snow Entomological Collection, University of Kansas. California: Alpine, L. D. Anderson 1929, and R. H. Beamer 1929; Laguna Mts., L. D. Anderson 1929; San Diego Co., R. H. Beamer 1929; Campo, H. W. Capps 1932; Indio, P. W. Oman 1929. Arizona: Santa Rita Mts., R. H. Beamer 1932, and L. D. Anderson 1929, and F. H. Snow; Huachuca Mts., R. H. Beamer 1927; Yavapai Co., P. A. Readio 1927; Chiricahua Mts., R. H. Beamer 1932; Pima Co., P. A. Readio 1927; Gila Co., P. A. Readio 1927; Sabino Canyon, Painter 1932.

Abedus indentatus (Hald.), 1853

(Plate LI, fig. 3)

1853. *Zaitha indentatus* Hald. Proc. Acad. Sci. Phila., VI, p. 364.
1863. *Pedinocoris brachonyx* Mayr. Verh. Zool.-Bot. Ges. Wien, XIII, p. 351.
1871. *Pedinocoris brachonyx* Mayr. Verh. Zool.-Bot. Ges. Wien, XXI, p. 405.
1877. *Abedus indentatus* (Hald.). Uhler, Wheeler's Rept. Chief Eng., p. 1331.
1900. *Abedus* Stal. Montandon, Bul. Sci. Bucharest, IX, Nos. 2, 3, p. 11.

Size. Female (one specimen in the collection): Length from the front of the eyes to the tip of the abdomen 35 mm.; width of head between inner posterior border of the eyes 3.5 mm.; width of anterior portion of prothorax 9 mm.; width of head including the eyes 8 mm.; width of the posterior border of the metathorax 13 mm.;

greatest width about mid-length of hemelytra 20 mm.; length of fore-tarsal claws .4 mm.; length of terminal fore-tarsal segment 1.1 mm.; length of the second fore-tarsal segment .9 mm.

Color. Dorsal side: yellowish-brown. Head, prothorax, mesothorax, and scutellum speckled with irregular dark-brown spots. Membrane of the hemelytra dark brown. Ventral side: tibiae of forelegs with two yellow crossbands on the outer surface, abdominal venter entirely pubescent with dark brown, reddish, velvety hairs. The caudal filaments covered with brown hairs.

Structural Characteristics. Antennae long and stout, four-segmented with a short, straight prolongation on the second and third segments. Membrane of hemelytra with closed cells and 2.9 mm. in width at its widest point. Metaxyphus broad and slightly elevated. Caudal filaments broad, stout, and covered with long hairs, and without a swollen pouch-like structure on the dorsal side of each.

Types. There is no information about types. Mayr, 1863, gives as the location of one specimen of this species "Kaiserliche Zoölogische Museum." Mayr, 1871, gives the Museum at Vienna as the location of specimens of this species.

Comparative Notes. This species is about the largest in the genus, but can be separated from the two other large species, *A. hungerfordi* De Carlo and *A. dilatatus* (Say), by antennae (Pl. L, fig. 3); metaxyphus; caudal filaments (Pl. LI, fig. 3); and fore-tarsal claw characters as given in the key to the species on pp. 497 and 498.

Data on Distribution. Mayr, 1863 and 1871, gives California as the place of collection of the specimens which are located in the "Kaiserliche Zoölogische Museum in Wien."

I have seen one specimen which is in the Francis Huntington Snow Entomological Collection, University of Kansas. Arizona: Ft. Grant, 1917. One specimen from the United States National Museum, Washington, D. C., which has no label.

Abedus herberti, n. sp.

(Plate LI, fig. 1)

Size. Male: Length from the front of the eyes to the tip of the abdomen 29 mm.; width of head between inner posterior border of the eyes 3 mm.; width of head including the eyes 7 mm.; width of anterior portion of prothorax 7 mm.; width of the posterior border of metathorax 10.5 mm.; greatest width about mid-length of hemelytra 16.5 mm.; length of fore-tarsal claws 1 mm.; length of terminal

fore-tarsal segment .9 mm.; length of second fore-tarsal segment 5 mm. Female: Similar to male in all measurements except length from the front of the eyes to the tip of the abdomen, which is 30 mm., and width of head between inner posterior border of the eyes, which is 4 mm.

Color. Dorsal side: dark, yellowish-brown. Head speckled with small, irregular darker brown spots. Prothorax, mesothorax, and scutellum nearly covered with dark brown irregular specks, except for a spindle-shaped, yellowish area extending from the posterior part of the prothorax and ending at the anterior border of the scutellum. An irregular dark yellow area extends from the anterior border to the posterior border on the median line of the prothorax. Ventral side: tibiae of forelegs and middle legs with two yellow crossbands on the outer surface. Abdominal venter entirely pubescent with dark brown, velvety hairs, which are reddish-brown along the border of the venter and also in the pleural region. Connexiva translucent yellow. Caudal filaments light yellow and a band of dark hairs crossing each filament beyond the middle.

Structural Characteristics. Antennae long and stout, three-segmented, having a short, straight prolongation on the second and third segments. The prolongations are shorter than those in the antennae of *A. breviceps* Stal, *A. signoreti* Mayr, and *A. ovatus* Stal; membrane of the hemelytra with closed cells and 1.8 mm. at its widest point; metaxyphus elevated but not keeled; caudal filaments broad, stout, and covered with long hairs. Each filament with an elongated, swollen pouch-like membrane on the dorsal side as shown on Plate LI, figure 1.

Types. Holotype, male; allotype, female; five paratypes, Arizona; F. H. Snow, collector. These are located in the Francis Huntington Snow Entomological Collection, University of Kansas, Lawrence, Kansas.

Comparative Notes. This species may be confused in size with *A. breviceps* Stal, *A. signoreti* Mayr, and *A. ovatus* Stal, but may be separated from them by antennae (Pl. L, fig. 1); metaxyphus; abdominal venter; membrane of the hemelytra; and caudal filament characters as given in the key to the species on pp. 497 and 498.

Data on Distribution. The Francis Huntington Snow Entomological Collection has specimens of this species from Arizona, F. H. Snow, collector. One specimen from the United States National Museum, Washington, D. C., labeled "Arizona, P. R. Uhler Collection."

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PLATE XLIX

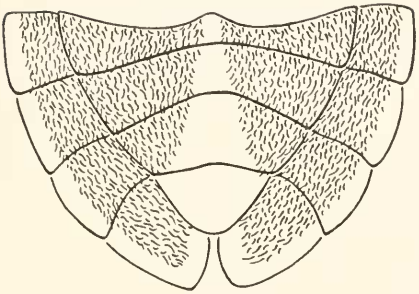
FIG. 1. Abdominal venter of *Abedus ovatus* Stal.

FIG. 2. Abdominal venter of *Abedus signoreti* Mayr.

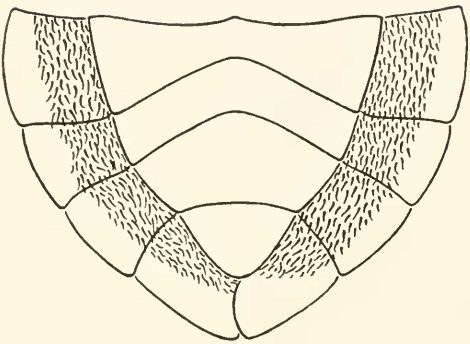
FIG. 3. Abdominal venter of *Abedus breviceps* Stal.

The figures are to illustrate the extent of pubescence mentioned in the key on page 497.

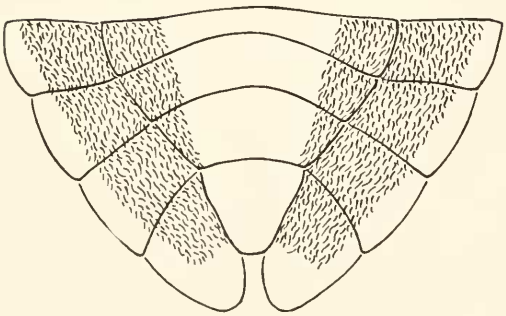
PLATE XLIX



1. A. ovatus



2. A. signoreti

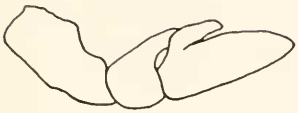


3. A. breviceps

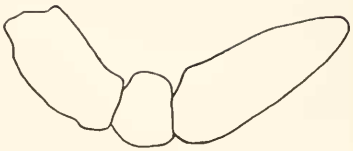
PLATE L

FIG. 1. Antenna of *Abedus herberti* Hidalgo.
FIG. 2. Antenna of *Abedus macronyx* (Mayr).
FIG. 3. Antenna of *Abedus indentatus* (Hald.).
FIG. 4. Antenna of *Abedus ovatus* Stal.
FIG. 5. Antenna of *Abedus montandoni* De Carlo.
FIG. 6. Antenna of *Abedus dilatatus* (Say).
FIG. 7. Antenna of *Abedus signoreti* Mayr.
FIG. 8. Antenna of *Abedus breviceps* Stal.
FIG. 9. Antenna of *Abedus hungerfordi* De Carlo.

PLATE L



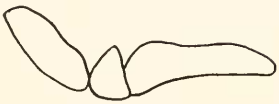
1. A. herberti



2. A. macronyx

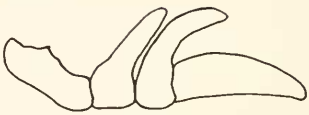
3. A. indentatus

4. A. ovatus



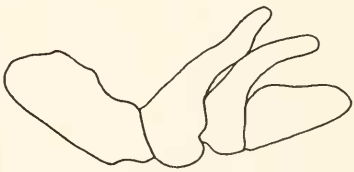
5. A. montandoni

6. A. dilatatus



7. A. signoreti

8. A. breviceps



9. A. hungerfordi

PLATE LI

FIG. 1. Retractile caudal filament of *Abedus herberti* Hidalgo.
FIG. 2. Retractile caudal filament of *Abedus breviceps* Stal.
FIG. 3. Retractile caudal filament of *Abedus indentatus* (Hald.).
FIG. 4. Retractile caudal filament of *Abedus signoreti* Mayr.
FIG. 5. Retractile caudal filament of *Abedus montandoni* De Carlo.
FIG. 6. Retractile caudal filament of *Abedus hungerfordi* De Carlo.
FIG. 7. Retractile caudal filament of *Abedus ovatus* Stal.
FIG. 8. Retractile caudal filament of *Abedus dilatatus* (Say).

At the base or upper end of each of these filaments will be seen the spiracle. Figures 7 and 8 show the swollen-like structure on the dorsal side of the filament mentioned in the key on page 497.

PLATE LI

1. A. herberti

2. A. breviceps

3. A. indentatus

4. A. signoreti

5. A. montandoni

6. A. bungerfordi

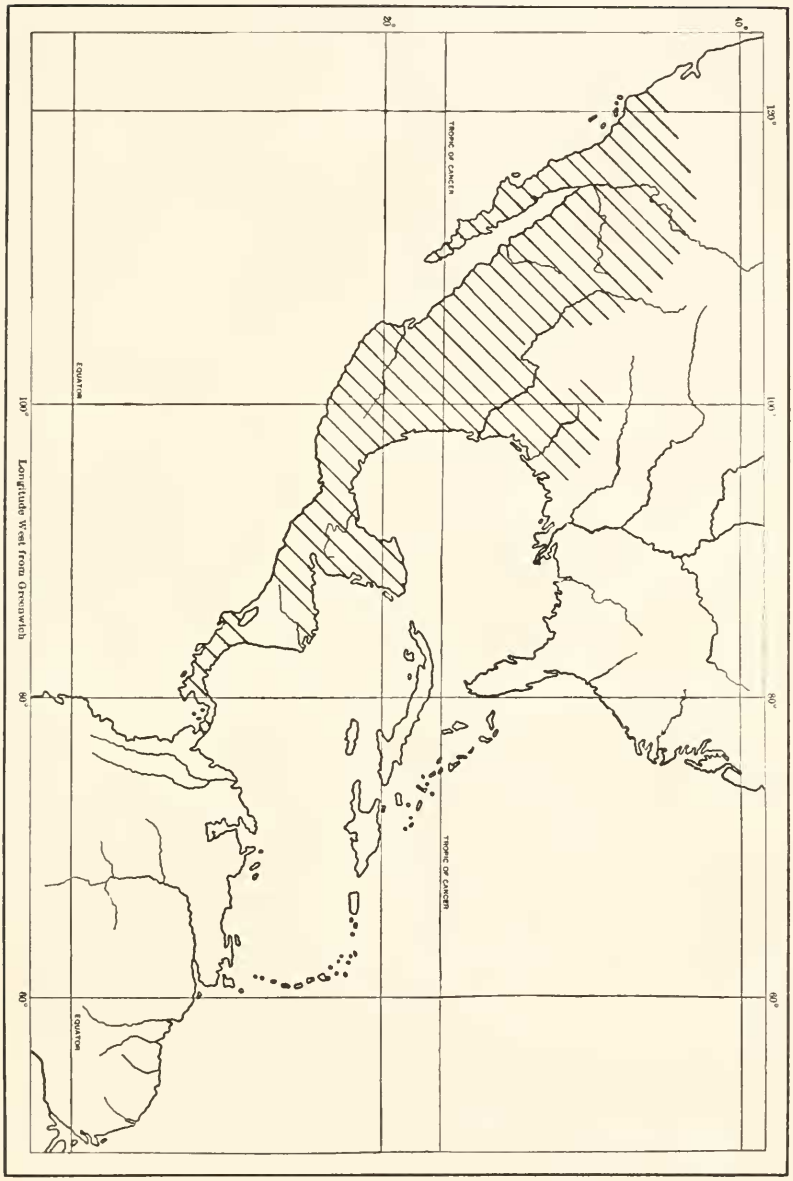
7. A. ovatus

8. A. dilatatus

PLATE LII

Map showing the distribution of the genus Abedus Stal.

PLATE LII


20°
40°
120°
100°
80°
60°
TROPIC OF CANCER
EQUATOR
Longitude West from Greenwich